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A LIST OF MOSSES COLLECTED UPON ISLE ROYALE, LAKE SUPERIOR

WILLIAM S. COOPER

The following list is mainly the result of one season's collecting by a beginner in the study of the mosses. To make the catalogue as complete as possible, sixteen species, not seen by the writer, have been added from the report of Mr. W. P. Holt, who collected upon the island during the summer of 1905,* and whose list of mosses includes a total of thirty-eight.

Isle Royale is a large island in the northwestern part of Lake Superior, distant 23 km. from the nearest point of the Canadian mainland. Vegetationally, it is included in the region dominated by the great Northeastern Conifer Forest. The Climax Forest of the island is composed mainly of Balsam Fir, Paper Birch, and White Spruce, and is exceedingly mesophytic in character. The principal lines of succession leading to its establishment are two. The Rock Shore Succession progresses through crustose, foliose and fruticose lichen, crevice, rock pool, heath mat, and xerophytic forest stages to the climax state. The xerophytic forest, not always present, is composed of Jack Pine and Black Spruce. The Bog Succession proceeds through aquatic, sedge, shrub-sphagnum, and bog forest stages, the last being composed of Tamarack, with Black Spruce or Arbor Vitæ or both. Many of the mosses were found to have definite places and rôles in these successions, which I have described in a paper that is now in process of publication in the "Plant World."

For the identification of doubtful specimens and verification of my whole collection, I am indebted to Miss Edith A. Warner, of Brooklyn, N. Y.

Sphagnaceae

1. *Sphagnum acutifolium* Ehrh.
2. *Sphagnum fuscum* (Schimp.) Klinggr.
3. *Sphagnum Girgensohnii* Russ. var. *molle* Grav., Holt.
4. *Sphagnum magellanicum* Brid.
5. *Sphagnum papillosum* Lindb. var. *intermedium* (Russ.) Warnst.
6. *Sphagnum platyphyllum* Sull. var. *subsimplex* (Ldbg.) Holt.
7. *Sphagnum recurvum* Beauv. var. *parvifolium* Sendtn.
8. *Sphagnum robustum* (Russ.) Rl. var. *gracile* Rl., Holt.
9. *Sphagnum teres* (Schimp.) Ångstr.
10. *Sphagnum Warnstorffii* Rußs.

The sphagna are as usual characteristic of the sphagnum-shrub zone of the bogs, and persist frequently into the bog forest.

*W. P. HOLT. Notes on the Vegetation of Isle Royale, Michigan. In "An ecological survey of Isle Royale, Lake Superior," prepared under the direction of Chas. C. Adams. State printers, Lansing, Mich., 1909.

Georgiaceae

11. *Georgia pellucida* (L.) Rabenh. Bog forest, abundant; climax forest, frequent.

Polytrichaceae

12. *Pogonatum alpinum* (L.) Roehl. Climax forest, on rocks and cliffs.
13. *Polytrichum commune* L. Various habitats, usually moist.
14. *Polytrichum juniperinum* Willd. Bare rock habitats; rock shores and burned areas.
15. *Polytrichum ohioense* R. & C. Raspberry Island.
16. *Polytrichum piliferum* Schreb. Bare rock habitats, burned areas and rock shores.
17. *Polytrichum strictum* Banks. Sphagnum-shrub zone of bogs, invading sphagnum, frequent; depressions on rock shores, occasional.

Dicranaceae

18. *Ceratodon purpureus* (L.) Brid. Dry rock habitats, particularly burned areas.
19. *Cynodontium polycarpum* (Ehrh.) Schimp.? Raspberry Island.
20. *Cynodontium polycarpum* (Ehrh.) Schimp. var. *strumiferum* Schimp. Boulders in climax forest near Blake Point.
21. *Dicranella Schreberi* (Sw.) Sch. "Near sphagnum bog at end of cabin trail"—Siskowit Lake. Holt.
22. *Dicranum flagellare* Hedw. Bog, climax, and burn forests; often on rotten wood.
23. *Dicranum fuscescens* Turn. Bog and climax forests, frequent.
24. *Dicranum longifolium* Ehrh. "Woods along Siskowit cabin trail." Holt.
25. *Dicranum scoparium* (L.) Hedw. Bog forest; wet places in climax forest; often on rotten wood.
26. *Dicranum undulatum* Ehrh. Climax forest, common; bog forest.
27. *Leucobryum glaucum* (L.) Schimp. Climax and bog forests, infrequent.
28. *Oncophorus Wahlenbergii* Brid. Bog forest.
29. *Selania caesia* Lindb. Shore rocks. Rock Harbor.
30. *Swartzia montana* (Lamk.) Lindb. Sheltered crevices in cliffs and shore rocks.

Grimmiaceae

31. *Grimmia ovata* Web. & Mohr. Shore rocks, abundant with crustose lichens.
32. *Grimmia unicolor* Hook. Shore rocks. Holt.
33. *Hedwigia albicans* (Web.) Lindb. Shore rocks; to some extent with crustose lichens; very abundant with foliose lichens; also on cliffs and boulders in climax forest and other situations.

34. *Rhacomitrium canescens* (Timm.) Brid. var. *ericoides* (Web.) Schimp. With *Cladonias* in a "rock opening" in the climax forest; one locality, near Siskowit Lake.

Tortulaceae

35. *Tortella tortuosa* (L.) Limpr. "Rock ridges, and other rocky places." Holt.

36. *Tortula ruralis* (L.) Ehrh. Sheltered crevices of cliffs.

Encalyptaceae

37. *Encalypta ciliata* (Hedw.) Hoff. Sheltered crevices of shore rocks and cliffs.

38. *Encalypta procera* Bruch. Same habitat as last.

Orthotrichaceae

39. *Amphidium lapponicum* (Hedw.) Schimp. Shore rocks at Park Place.

40. *Orthotrichum anomalum* Hedw. Shore rocks with crustose and foliose lichens, abundant.

41. *Orthotrichum speciosum* var. *Killiasii* Sch. Shore rocks at Park Place.

42. *Ulota americana* (Beauv.) Lindb. "Growing on gently sloping rock shore, sometimes covering crustaceous and foliose lichen patches." Holt. It is possible that *Orthotrichum anomalum*, which is very abundant in such places, was mistaken for this species.

Splachnaceae

43. *Splachnum ampullaceum* L. Bog forest.

Funariaceae

44. *Funaria hygrometrica* (L.) Sibth. Dry rocky places and clearings, especially after recent burning.

Meeseaceae

45. *Paludella squarrosa* (L.) Brid. "Bog margin of Forbes Lake." Holt.

Aulacomniaceae

46. *Aulacomnium palustre* (L.) Schwaegr. Invading sphagnum in bogs; bog forest; wet depressions upon rock shores.

47. *Aulacomnium palustre* (L.) Schwaegr. var. *polycephalum* B. & S. Bog forest near Park Place.

Bartramiaceae

48. *Bartramia pomiformis* (L.) Hedw. Boulders and cliffs in climax forest and other sheltered situations.

Bryaceae

49. *Bryum caespiticium* L. Recent burn on Smithwick Island.
50. *Bryum capillare* L. Blake Point.
51. *Bryum inclinatum* (Sw.) B. & S. Climax forest near Blake Point.
52. *Bryum intermedium* Brid. Island near Park Place.
53. *Bryum Muhlenbeckii* B. & S. Rock pools and wet crevices of shore rocks.
54. *Bryum pallens* Swartz. "On dead wood and on thinly covered rock surfaces in woods." Holt.
55. *Bryum pendulum* (Hornsch.) Schimp. Bog forest at Sumner Lake.
56. *Bryum roseum* (Weis.) Schreb. Bog forest.
57. *Leptobryum pyriforme* (L.) Wils. Sheltered rock crevices.
58. *Mnium marginatum* (Dicks.) P. Beauv. Shore rocks near Park Place.
59. *Mnium orthorrhynchum* B. & S.? Shore rocks near Park Place.
60. *Mnium punctatum* L. var. *elatum* Schimp. Bog forest, common.
61. *Mnium spinulosum* B. & S. Burn forest near Park Place.
62. *Mnium subglobosum* B. & S. Bog forest, frequent; climax forest.
63. *Pohlia cruda* (L.) Lindb.? Climax forest near Blake Point.
64. *Pohlia nutans* (Schreb.) Lindb. In a great variety of habitats, most abundant in bog forest; also upon sphagnum in open bogs, and in climax and burn forests.

Leskeaceae

65. *Leskea nervosa* (Schwaegr.) Myr. "Rock shores." Holt.
66. *Pterygynandrum filiforme* (Timm.) Hedw. Climax forest near Blake Point.
67. *Thuidium abietinum* (L.) B. & S. Sheltered cliffs along rock shores; cliffs and boulders in climax forest, common.
68. *Thuidium delicatulum* (L.) Mitt. Boulders and cliffs in climax forest.

Hypnaceae

69. *Amblystegium fluviatile* (Sw.) B. & S. Rock pools on Gull Islands.
70. *Amblystegium Kochii* B. & S. Rock pool margin. Island near Park Place.
71. *Amblystegium varium* (Hedw.) Lindb. Island near Park Place.
72. *Brachythecium oxycladon* (Brid.) J. & S.? Duncan Bay.
73. *Brachythecium rutabulum* (L.) B. & S. Island near Park Place.
74. *Brachythecium velutinum* (L.) B. & S.? Duncan Bay.
75. *Calliargon cordifolium* (Hedw.) Kindb. Bog forest at Sumner Lake.
76. *Calliargon Richardsonii* (Mitt.) Kindb. Very wet depressions in bog forest.

77. *Calliergon Schreberi* (Willd.) Grout. The most abundant and widely distributed moss of Isle Royale. Together with *Hylocomium proliferum* and *Hypnum crista-castrensis* makes up the bulk of the moss carpet of the climax forest. Also common in the bog forest, and frequently found growing over the *sphagnum* of open bogs, preventing its further upward growth. The most abundant moss of the jack-pine-black-spruce forest, gradually replacing the *Cladonias*. Also found in sheltered places upon the rock shores.

78. *Calliergon stramineum* (Dicks.) Kindb. Siskowit Lake.

79. *Camptothecium nitens* (Schreb.) Schimp. Sedge-sphagnum zone of bogs.

80. *Campylium chrysophyllum* (Brid.) Bryhn. Duncan Bay.

81. *Campylium polygamum* B. & S.?

82. *Campylium stellatum* (Schreb.) Bryhn. Bog forest, frequent; rock pool margin.

83. *Climacium americanum* Brid. Bog forest and wet places in climax forest; margins of rock pools.

84. *Climacium dendroides* (L.) Web. & Mohr.? Margin of rock pool. Island near Park Place.

85. *Drepanocladus aduncus* (Hedw.) Warnst. "Bog at end of Siskowit Bay cabin trail." Holt.

86. *Drepanocladus fluitans* (Dill.) Warnst. Bog on Raspberry Island.

87. *Drepanocladus uncinatus* (Hedw.) Warnst. Bog forest, common; climax forest.

88. *Drepanocladus vernicosus* (Lindb.) Warnst. Bog near Siskowit Lake. Holt. A moss, probably this species, found as a fossil in sphagnum masses several decimeters below the surface, Raspberry Island.

89. *Eurhynchium strigosum* (Hoff.) B. & S. Duncan Bay. Smithwick Island.

90. *Eurhynchium strigosum* (Hoff.) B. & S. var. *præcox* (Hedw.) Husnot. Park Place.

91. *Hygrohypnum palustre* (Huds.) Loeske? Shore rocks at Park Place.

92. *Hygrohypnum polare* (Lindb.) Broth. "Protected rock crevices, Rock Harbor." Holt.

93. *Hylocomium proliferum* (L.) Lindb. One of the three important mosses of the climax forest; also abundant in the bog forest, and occurs occasionally in many other habitats.

94. *Hylocomium triquetrum* (L.) B. & S. Climax forest, frequent; common along its edge and in drier portions.

95. *Hypnum crista-castrensis* L. One of the three important mosses of the climax forest, and the most strictly mesophytic in habitat preference. Occurs also in bog forest and occasionally elsewhere.

96. *Hypnum curvifolium* Hedw.? Park Place.

97. *Hypnum imponens* Hedw. Old burn forest near Forbes Lake, on rotten wood.

98. *Hypnum Patientiæ* Lindb. McCargoe's Cove.
99. *Hypnum reptile* Mx. Park Place.
100. *Plagiothecium denticulatum* (L.) B. & S. Bog forest, common; climax forest.
101. *Plagiothecium turfaceum* Lindb. Same habitat as last.
102. *Scorpidium scorpioides* (L.) Limpr. Sedge zone in bogs.

Neckeraceae

103. *Neckera oligocarpa* Bruch. "Forest road, Washington Harbor; woods." Holt.
104. *Neckera pennata* (L.) Hedw. Climax forest, cliffs and boulders; sheltered shore rocks.

Leucodontaceae

105. *Leucodon sciurioides* (L.) Schwaegr. Boulders and cliffs in climax forest.

Fontinalaceae

106. *Dichelyma uncinatum* Mitt.? "Growing in a pool on small island at upper end of Rock Harbor." Holt.
CARMEL, CALIFORNIA, May, 1912.

DITRICHUM RHYNCHOSTEGIUM KINDB.

In the BRYOLOGIST for November in the additions to the list of mosses of West Virginia published by Prof. Sheldon this species is listed from Cranberry Glades (3743). I have since had the privilege of examining these specimens and cannot see how they differ from *Ditrichum pallidum*. The original description¹ calls for a dioicous species, but the antheridia were found to be in clusters below the perichætium, therefore autoicous.

ELIZABETH G. BRITTON.

NEW YORK BOTANICAL GARDEN, December 4th, 1912.

¹ Revue Bryologique 37: 14. 1910.

PLAGIOTHECIUM GEOPHILUM (AUST.) GROUT

I have found this species at two stations in Ohio. First, I found it fruiting, with the capsules just beginning to cast their lids, Dec. 1 to 5, 1909, growing on clay and shales, on the steep sides of gullies and ravines in open deciduous woods in the neighborhood of Sulphur Lick Springs, Ross County. I cannot say how abundant it was, as it was my maiden collecting trip, and I adhered